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(71) Applicant: **NGK INSULATORS, LTD.**
Nagoya-City, Aichi Prefecture 467-8530 (JP)

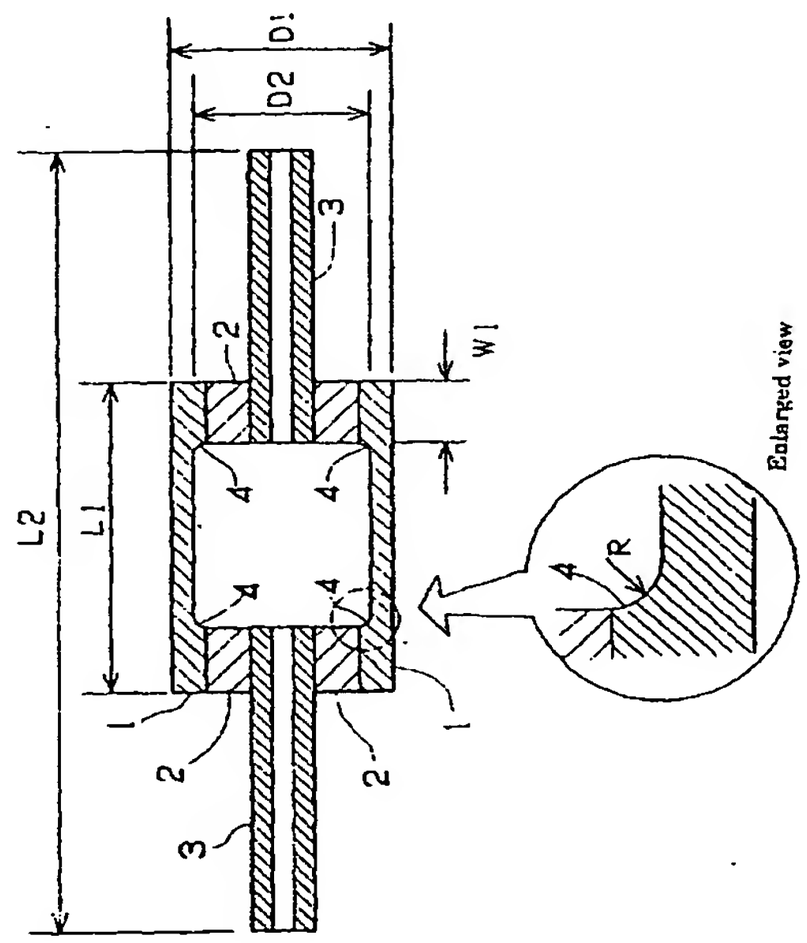
(72) Inventor: **Miyazawa, Sugio,**
***c/o* NGK Insulators, Ltd.**
Nagoya-shi, Aichi-ken, 467-8530 (JP)

(74) Representative: **Paget, Hugh Charles Edward et al**
MEWBURN ELLIS
York House
23 Kingsway
London WC2B 6HP (GB)

(54) Ceramic envelope for high intensity discharge lamp

(57) A ceramic envelope for high intensity discharge lamp comprises a cylindrical barrel section 1 that forms an electric discharge light emitting space, an annular closing section 2, that closes both ends of the barrel section 1. Capillary sections 3 receive electric discharge electrodes to be outwardly protruded so as to be opposed to each other from the substantial center position of both closing sections. The envelope is made of an alumina-based material and is formed so as to have light transmitting properties. At an interior face of a barrel section at a boundary part 4 between the closing section 2 and an electric discharge light emitting space corner of the barrel section 1, a rounded interior corner 1.0 mm in curvature diameter is provided so that the thickness is gradually changed. In this manner, a ceramic envelope capable of extended service life is provided even if the electric discharge light emitting space is cylindrical.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to a ceramic envelope made of a light transmission ceramics used for a high intensity discharge lamp such as high pressure sodium lamp or a metal halide lamp.

DESCRIPTION OF RELATED ART

[0002] Conventionally, an electric discharge lamp using a ceramic envelope made of light transmission ceramics is widely used as a ceramics metal halide lamp. In this type of the lamp, an electric discharge light emitting space is formed in a cylindrical shape. Such a ceramic envelope has a structure as shown in FIG. 3A and FIG. 3B, i.e., a cylindrical barrel section 10 forming an electric discharge light emitting space at its center. Its left and right ends are closed by an annular closing material 11, and its structure is provided such that a capillary tube 12 is connected in facing opposite to each other at the substantial center of the closing material 11. Then, after a light emitting substance or startup gas is sealed in an electric discharge light emitting space, an electrode is inserted into the capillary tube 12, and is sealed, thereby forming an electric discharge lamp.

[0003] These sections such as the barrel section 10, closing plate 11, and capillary tube 12 are each molded independently, and are integrally coupled with each other, thereby forming a ceramic envelope.

[0004] In the above ceramic envelope having the cylindrical electric discharge light emitting space, a temperature at a corner part of a cylinder is the lowest during lighting. Thus, a light emitting substance, which is a corrosive substance, easily accumulates at that site. As a result, although a light color change in the lighting direction is reduced, corrosion at the corner is easily advanced because the light emitting substance easily accumulates. The corrosion at that portion determines a service life of the lamp.

[0005] In addition, in such a ceramic envelope having a cylindrical electric discharge space, there is employed a fabrication method in which plural parts are assembled and bonded due to contraction action during burning. As shown in FIG. 3A, which is a partially enlarged view of the envelope, a wedge shaped cavity 13 is easily formed at a bonding section. In particular, a light emitting substance easily enters the cavity 13 generated at the corner of the barrel section 10, which causes corrosion, and impairs extended service life. Further, such a wedge shaped cavity easily causes stress concentration, and extended service life is impaired due to a thermal stress generated during lighting.

SUMMARY OF THE INVENTION

[0006] The present invention has been made in order to solve the foregoing problem. It is an object of the present invention to provide a ceramic envelope for high intensity light emitting lamp capable of extending the service life of the lamp even if an electric discharge light emitting space is formed in a cylindrical shape.

[0007] According to a first aspect of the present invention, there is provided a ceramic envelope made of a light transmission ceramics for high intensity discharge lamp comprising a cylindrical barrel section that forms an electric discharge light emitting space, an annular closing section that closes both ends of the barrel section, and a capillary section that inserts and fixes an electric discharge electrode to be outwardly protruded so as to be opposed to each other from the substantial center of both closing sections.

R is provided at an end of an interior face of the barrel section that is a boundary part between said barrel section and closing section, thereby avoiding a factor for impairing extended service life due to generation of the wedge shaped cavity section.

Preferably the R value is from 0.01 mm to 2.0 mm.

[0008] Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0009] The accompanying drawings illustrate preferred embodiments of the present invention, and together with the general description given above and the detailed description of the preferred embodiments given below, serve to explain the principle of the present invention.

[0010] FIG. 1 is an illustrative cross section of a ceramic envelope for high intensity discharge lamp illustrating one embodiment of the present invention.

[0011] FIG. 2 is an illustrative cross section of a ceramic envelope for high intensity discharge lamp illustrating another embodiment of the present invention.

[0012] FIG. 3A and FIG. 3B are illustrative cross sections of a conventional ceramic envelope for high intensity discharge lamp, in which reference numeral 1 denotes a barrel section, reference numeral 2 denotes a capillary section, and reference numeral 3 denotes a boundary part.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Hereinafter, preferred embodiments of the present invention will be described in detail with refer-

ence to the accompanying drawings.

[0014] In FIG. 1, an example of a ceramic envelope for high intensity discharge according to the present invention is shown. This envelope has a cylindrical barrel section 1 that forms an electric discharge light emitting space at its center. Its both ends are closed by an annular closing sections 2, 2, and capillary sections 3, 3 having their small diameters are brought into protrusive contact with each other so as to be in parallel to the barrel section 1 from the center of the closing section 2 and so as to be opposed to each other. This capillary section 3 is intended to insert, seal, and fix a rod shaped electrode conductor (not shown) having an electric discharge electrode provided at its tip end.

[0015] These members, each of which is made of an alumina-based material, are molded, assembled, and fired, whereby they are formed so as to have light transmission properties. An example of dimensions of each section is shown here. An outer diameter D1 of the barrel section 1 is 11.6 mm, an inner diameter D2 is 9.4 mm, a length L1 is 19 mm, thickness W1 of the closing section is 3 mm, and a full length L2 of a light emitting tube is 47 mm.

[0016] In addition, as shown in one of the enlarged view, at an interior face of the barrel section 1 at the boundary part 4 with the closing section 2 that is a corner of an electric discharge light emitting space, at the interior face a rounded concave corner is provided to join smoothly the inner face of the barrel portion and the inner face of the closing section. This concave corner, as seen in axial section of the envelope, has a diameter of curvature R of 1.0 mm. This rounded corner prevents generation of a wedge at the electric discharge light emitting space corner.

[0017] By providing R at the corner of the electric discharge light emitting space of the easily corroded barrel section, the generation of a wedge shaped cavity at the corner can be prevented, and the service life can be extended.

[0018] In this case, the R value causes small effect if the value is smaller than 0.01 mm. In addition, if it exceeds 2.0 mm, the lamp efficiency is lowered due to an increase of ceramics capacitance, and further, light emission substance hardly accumulates at the corner. Consequently, advantageous effect of the cylindrical shaped electric discharge light emitting space is lowered. Thus, the value ranging from 0.01 mm to 2.0 mm is preferable. In particular, the value ranging from 0.3 mm to 1.0 mm is more preferable.

[0019] FIG. 2 shows another embodiment of the present invention. The figure also shows a case in which the entirety of the barrel section 1, closing section 2, and capillary section 3 are integrally molded. Materials and outward forms are the same as described in the above embodiments.

[0020] In integral molding in such a shape, the barrel section, closing section, and capillary section can be easily molded without any interface as compared with the above embodiments. This is because the entire water content ratio or partial water content ratio as well as the composition of each section must be finely adjusted so as to generate no interface in the above embodiments.

[0021] By means of a lost wax or by applying a frost molding technique, injection molding technique, or gel casting technique to the lost wax, such integration molding can be easily carried out. By carrying out integral molding, a wedge shaped cavity is not formed, and the service life can be extended constantly. In addition, by carrying integral molding, R can be easily provided at a boundary part between the barrel section 1 and the closing section 2. By providing R, stress concentration hardly occurs and then a crack hardly occurs, which contributes to further extended service life.

[0022] R may be provided at only one site of the left and right corners of the electric discharge light emitting space. In the case where the ceramic envelope is used in an erect condition, a light emitting substance easily accumulates at one side of the bottom part. Thus, R may be provided at downward side.

[0023] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspect is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept.

Claims

1. A ceramic envelope made of a light transmission ceramics for high intensity discharge lamp comprising:

   a barrel section that forms an electric discharge light emitting space;
   annular closing sections that close both ends of the barrel section, respectively; and
   capillary section to receive electric discharge electrodes to be protruded so as to be opposed to each other from the substantial center of both closing sections,

   wherein at at least one of the boundary parts between said barrel section and said closing sections, a rounded interior corner is provided at the end of the barrel section.

2. A ceramic envelope for high intensity discharge as claimed in claim 1, wherein the diameter of curvature of the corner (R) is from 0.01 mm to 2.0 mm.

FIG.1

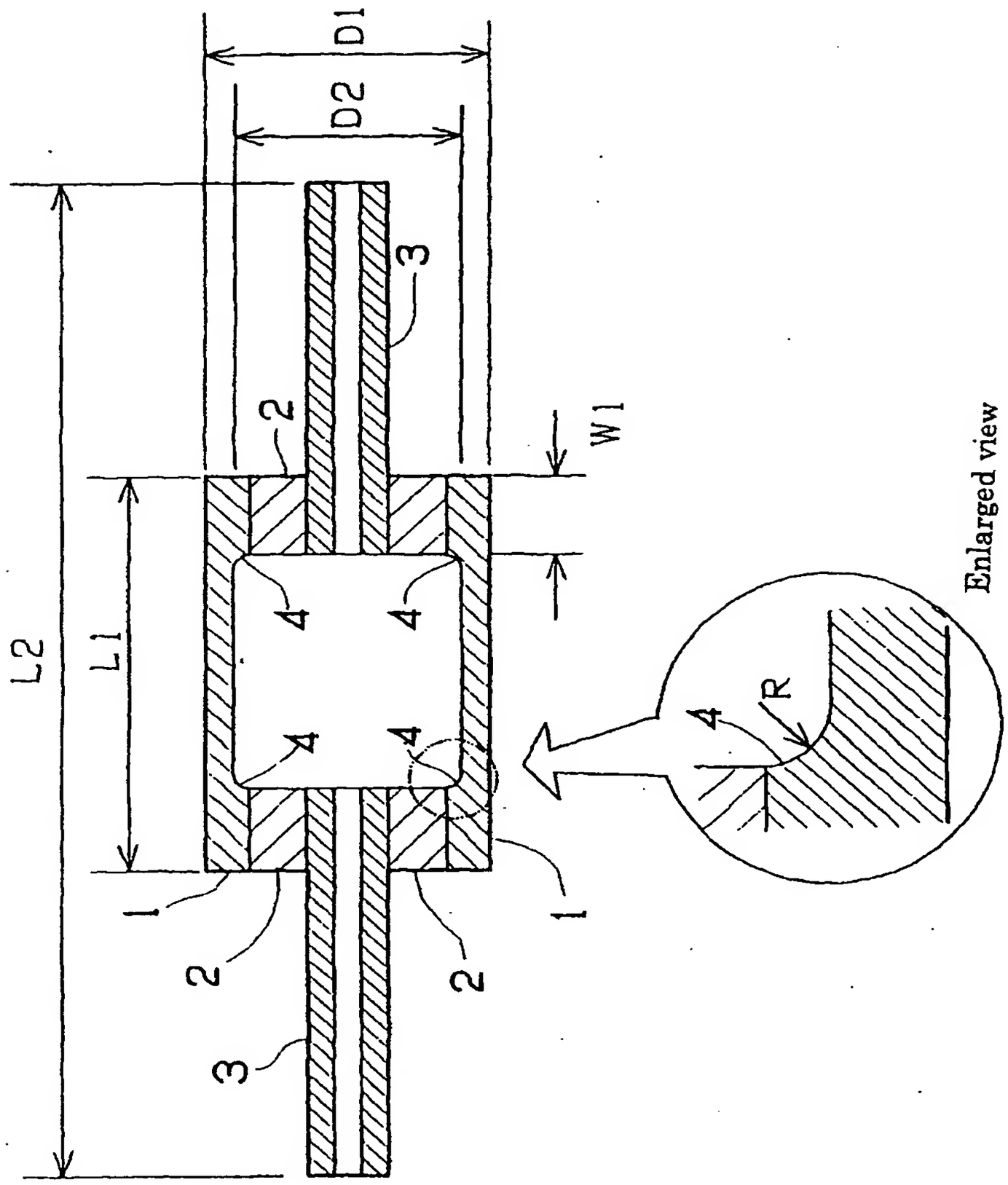


FIG.2

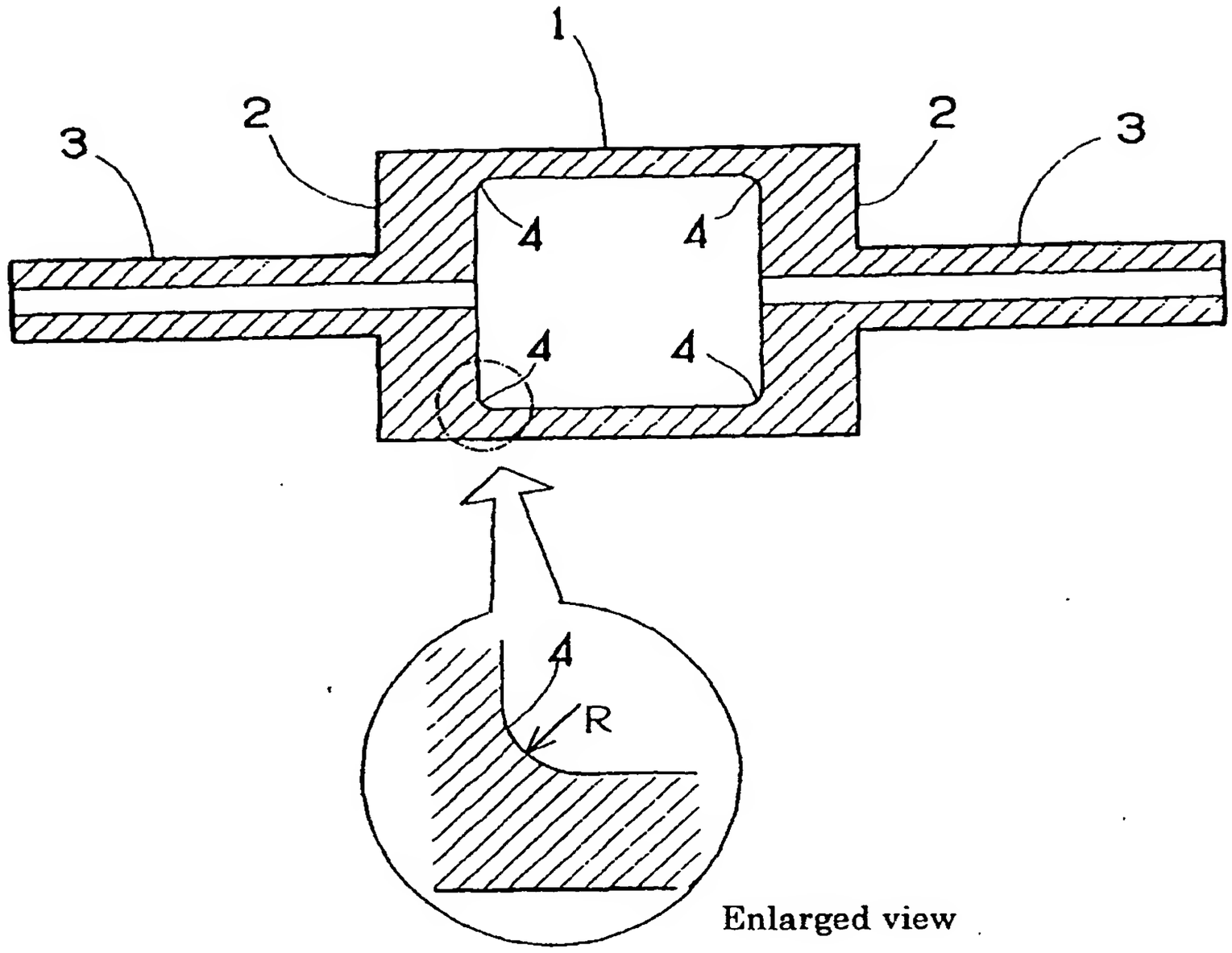
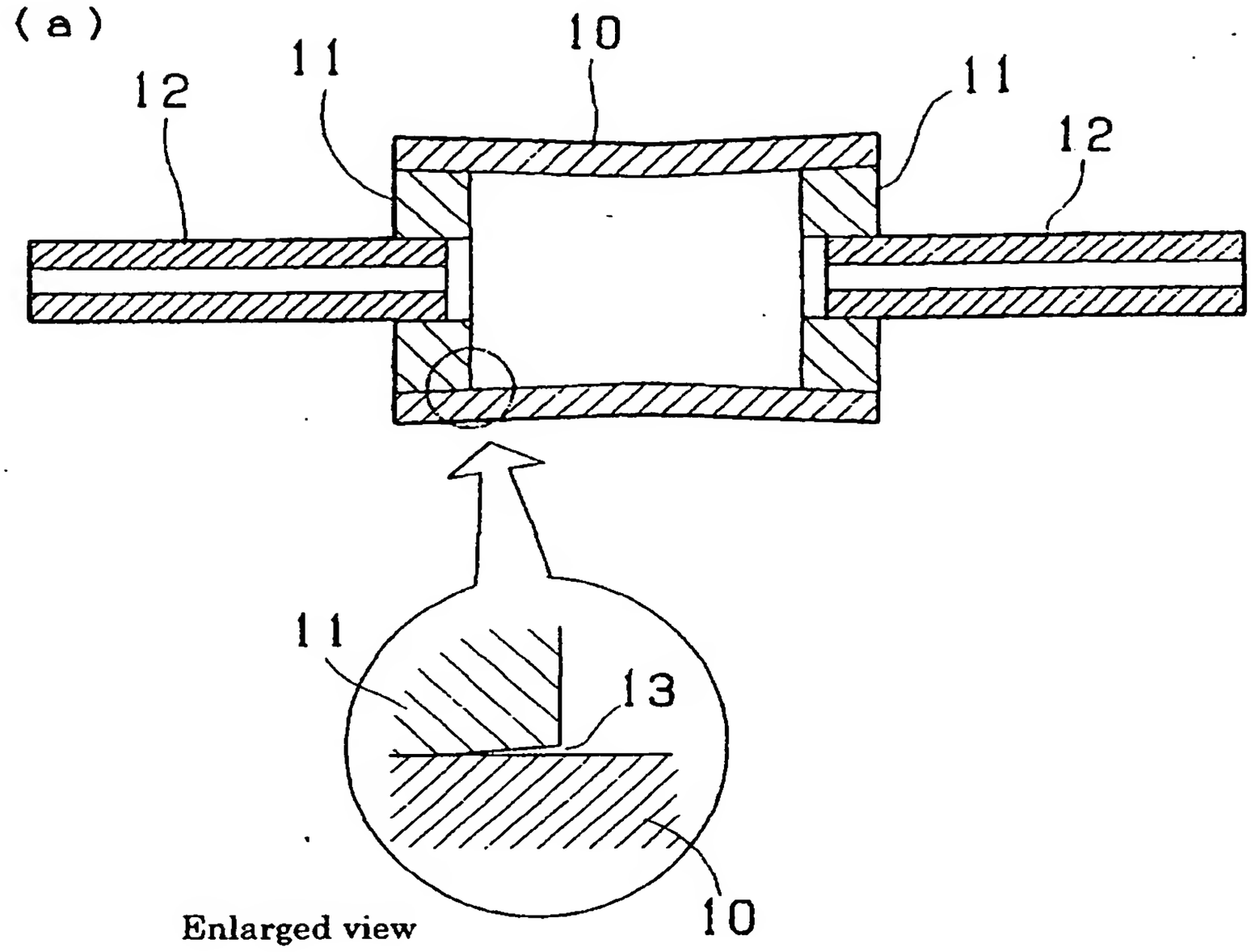


FIG.3



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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 9263

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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

H01J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 January 2002	Deroubaix, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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